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DATA PROCESSING DIGEST

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Management Sciences

THINKING AHEAD: POTENTIALS OF MANAGEMENT SCIENCE

Peter F. Drucker
HARVARD BUSINESS REVIEW, January-February 1959; pages 25-30, 146-150

A gimmick looking for an application

The author sees management science becoming a "management gadget bag" instead of a discipline. He believes that much of the work being done in the name of management science is "little more than a refinement of industrial engineering, cost accounting, or procedures analysis."

Only the industrial dynamics program at M.I.T. and the operations research and synthesis work in certain parts of General Electric emphasize the "risk-making, risk-taking, decision-making job." Most of the work being done ignores the "one fundamental insight underlying all management science...the business enterprise is a system of the highest order: a system the 'parts' of which are human beings contributing voluntarily of their knowledge, skill, and dedication to a joint venture." The one characteristic of all systems is "interdependence. The whole of a system is not necessarily improved if one particular function or part is improved or made more efficient. In fact, the system may well be damaged thereby, or even destroyed."

Examples of such damage to a system are "inventory controls that improve production runs and cut down working capital but fail to consider the delivery expectations of the customer and the market risks of the business; machine-loading schedules that overlook the impact of the operations of one department on the rest of the plant; forecasts that assume the company's competitors will just stand still."

The problem is that "management science began with the application of concepts and tools developed within a host of other disciplines for their particular purposes....As a result, the focus of much of the work in management science has not been on such questions as: What is the business enterprise? Rather, the focus has been on: Where can I apply my beautiful gimmick?"

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Business is first of all a system

Management science must therefore "define the specific nature of its subject matter. This might include as a basic definition the insight that the business enterprise is a system made up of human beings. The assumptions, opinions, objectives, and even the errors of people (and especially of managers) are thus primary facts for the management scientist." The postulates upon which management science must be based might include these ideas:

1. The business enterprise produces neither things nor ideas but humanly determined values.

2. Measurements in the business enterprise are complex symbols such as "money."

3. Since economic activity, of necessity, is the commitment of present resources to an unknowable and uncertain future, risk making and risk taking constitutes the basic function of enterprise.

4. The business exists as the agency of change in an industrial society.

Risk-taking is the business of Business

In addition to defining its nature and recognizing itself as a discipline, management science must "take its subject matter seriously." Its main goal must be "to enable business to take the right risk," and in fact "to take greater risks--by providing knowledge and understanding of alternative risks and alternative expectations; by identifying the resources and efforts needed for desired results and by mobilizing energies for the greatest contribution; and by measuring results against expectations, thereby providing means for early correction of wrong or inadequate decisions."

General Information

OFFICE MANAGEMENT YEAR BOOK

OFFICE MANAGEMENT, January 1959

The Year Book edition of OFFICE MANAGEMENT contains articles in six general areas of interest to business management: automation, personnel, systems design, office layout, office tools, and catalogs. In the first section, automation, an editorial points out that office automation has slowed down because of the recession, during which businesses cut down on equipment purchases and effected systems economies which they mistake for the long-range reforms generally expected in an EDP installation.

Six possible hidden costs

In an article on controlling hidden costs in an EDP installation, Ralph E. Weindling of John Diebold & Associates points out six factors leading to unnecessarily high costs: 1) poor programs, 2) bad programing practices, 3) unprofitable applications, 4) too much--or too little--equipment, 5) inexpensive people, 6) inadequate preparation.

The third article in this section is a description of the "Total Systems Approach," which the Carborundum Company has used in designing their integrated electronic data processing system. The system is based on the premise that the source of all company operations and all company paperwork was the sales order. This is the initiatory document for the company's activities; as its information is used to start production or shipping operations (depending on the status of inventory), it is supplemented by original data in four other areas: manpower information; materials, supplies and services; physical assets, and master information records.

"As the customer order comes into the company and proceeds through the company, it generates the expenditure of cash for manpower, materials, supplies and services, and physical assets. These varied inputs and the documents which record them, when coupled with information drawn from the master information records, produce two types of output--sales, which replenish the cash of the company; and new information for master record entry--new product specifications, new prices, new discounts, etc."

AUTOMATION AND EMPLOYMENT OPPORTUNITIES FOR OFFICE WORKERS

Published by U.S. Dept. of Labor and Veterans Administration

A fourteen-page pamphlet on job opportunities in office automation has been prepared for use in vocational guidance. The pamphlet is divided into two sections. The first portion gives a generalized view of office automation--how computers are used for office work, what kinds of jobs are created or eliminated by EDP, and what types of industries are using office automation extensively.

In the second portion of the pamphlet, the new job of programer is described in its various aspects of analyst, systems designer, programer and coder. Brief descriptions are given of the type of work, the training necessary, working conditions, salary expectations, and information sources. The pamphlet may be purchased from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Ask for Bulletin No. 1241. Price: 15¢.

PROCEEDINGS OF THE INSURANCE ACCOUNTING AND STATISTICAL ASSOCIATION, 1958

The electronics section of this large transcript of proceedings of the I. A. S. A. begins on page 338, and includes 24 short papers on the use of electronic computers in insurance applications. These cover eight IBM 650's, four IBM 705's, three RAMAC's, two Datatrons, a Bizmac and a Univac File Computer. The major part of each paper is a recital of the company's characteristics and planning for electronics. A paper titled "Internal Audits and Controls" gives some thought to the problems of control in an electronic system. The methods of control are techniques, organization, and reporting. Of these three, the effect of automation on reporting is seen as the most significant.

Control total printout may not be economically practical

It is suggested here that since the form of source documents will be such as to weaken or eliminate the possibility of post audit review, control could be moved to the point of origin, or the computer could be programed to make the same kind of review of the source document that the human controller now makes. During the processing, control totals may be provided at the end of the process. Such a print-out, however, must be governed by considerations of the cost of storage, the need for data protection, and the requirements of operating personnel. Even where it may be possible to store data on magnetic tape for such a print-out, it may not be economically practical. On the other hand, specific needs, such as the answering of policy holder inquiries, require print-outs, at least at the present time.

Automation will affect organization in the mechanization of data processing work, the segregation of data processing functions, the centralization of data processing activities, and integration of data processing procedures. The effect of automation on reporting will be the most significant change in the concept of control. The accountant will be in the position of planning and producing the reports which will be effective management tools. With these tools, management can make more informed decisions.

The Proceedings may be ordered from I. A. S. A., P. O. Box 139, Kansas City, Missouri, Mr. L. J. Hale, Secretary-Treasurer. Price: $20.

WAYNE'S COMP LAB STARTS NEW PROBLEM

COMPUTING NEWS, December 15, 1958; pages 6-9.

Wayne State University's Computation Laboratory has begun a machine language translation research program, working in the field of mathematics, and joining ten other centers in the country working on Russian-into-English translation in the sciences. Two illustrations are given: one of an English page man-translated, with words numbered for the translation study; the other example of the original Russian text.

ELECTRONICS IN BUSINESS

Gardner M. Jones
Published by Bureau of Business and Economic Research, Michigan State University. $3.50

Here is a small book with a single-minded purpose: "to assist businessmen in measuring the usefulness of [electronic computer systems] in their own company situations" specifically in the accounting function.

For the accountant

This purpose is reflected in the titles of the chapters: The Accounting Function, The Organization of Accounting Services, The Nature of Electronic Data Processing, The Effects of Electronics on the Accounting Function within the Firm, The Effects of Electronics on Accounting Relationships Outside the Firm, The Effects of Electronics on Accountancy. By keeping to this one theme, the author does accountants and those concerned with the financial reporting system of a business a real service. There is no straying from the subject into interesting by-paths of hardware, or design theory, or specific areas of business activity such as inventory control. Instead, the purpose of the accounting function is explored in terms of its service to the management of the business, and its relation to the business' integrated activities.

The monograph does not contain any original material, but is rather an interpretation of the literature of electronic accounting, an excellent introduction for the accountant not yet acquainted with the significance of EDP.

NINE WAYS TO AVOID A HEADACHE

MANAGEMENT AND BUSINESS AUTOMATION, January 1959; pages 34-36, 49

Important points and problems in the preparation of a site for an EDP installation are listed and discussed. These are:

EDP installation site preparation

1. Temperature: Air conditioning must be provided in adequate amounts for both the machines and the personnel.

2. Humidity: Special controls and attention to outside windows are necessary to assure the steady rate of humidity required.

3. Water cooling: In some installations, cooled water is used in such quantities that it must be recirculated and re-cooled.

4. Floors: Floors must be able to bear heavy loads. Special flooring may be used which accommodate electrical conduits and air conditioning pipes.

5. Ceilings: Acoustic treatment is needed.

6. Walls: Acoustic treatment from ceiling to shoulder height is advisable.

7. Wiring and power: Heavier than standard conduits and wiring is required, and should provide for additional equipment.

8. Visitor facilities: Visitors should be able to see the installation without walking through.

9. Decoration: The sombre colors of the machines absorb light, so the decorating scheme should be light and colorful to compensate.

THE IMPACT OF EDPM ON ACCOUNTING

R. Frank Thomas, IBM Corp., New Orleans, La.
N.A.A. BULLETIN, December 1958; pages 26-28

Electronic data processing will affect the accountant's job and the education of those preparing for the accountancy profession. First, the accountant will find that electronics will relieve him of routine report preparation and enable him to take on more critical tasks of analysing and interpreting reports. Second, the accountant will find it necessary to know something about the interaction of the various functions of the business in order to effect any application for electronic data processing. Third, his formal education will need to include training in thinking logically and making effective decisions. Fourth, he will need increased imagination and creativity, as well as enthusiasm for the new methods.

FILMSTRIP ON TIMEKEEPING

A very good sound filmstrip called "Timekeeping--the Modern Way" has been produced by Executone, Inc. It shows how an intercom system may be used for centralized timekeeping and production control. The film is available for free showing from local Executone dealers. Or write to: Executone, Inc., 415 Lexington Avenue, New York 17, New York.

Programing

AUTOMATIC FAILURE RECOVERY IN A DIGITAL DATA PROCESSING SYSTEM

R. H. Doyle, R. A. Meyer, R. P. Pedowitz, IBM Corp.
IBM JOURNAL OF RESEARCH, January 1959; pages 2-12.

FIX breaks an accidental loop

FIX is a "first aid" program designed to enable the Air Defense Program of SAGE to find and correct errors as they occur during processing. The central computer of the SAGE system is in duplicate, so that a standby computer is always ready to perform. However, FIX has some corrective measures beyond this structural one. A portion of the FIX program is permanently stored in core memory, and upon alarm, this portion activates the main section of FIX, in addition to saving a portion of memory for a working area for FIX.

The FIX program performs parity checks on words in conventional style. FIX also discovers errors which result in a non-terminating loop or an illegal delay for which there is no terminating action. A third type of error alarm sensed by FIX is the overflow. In transfer operations, FIX checks the drum-parity-alarm at the end of every block transfer by means of a program instruction. If an error is found, FIX branches to the drum recovery program.

Errors are diagnosed and logged for corrective maintenance studies. If the operator wishes, he may have the diagnosis displayed immediately. Errors are recorded in a "Learning Table" in the memory, and as each error is sensed, FIX consults the Learning Table for prior information on the particular trouble spot in determining corrective action. As an error occurs, FIX saves the contents of all registers, for diagnostic purposes, and to restore the program to its environment in order to make a recovery. If a faulty word is discovered in the core memory, FIX attempts to find the correct word in drum storage and replace the faulty work with it.

Back to pre-error condition

If the error cannot be corrected by word recovery means, the program may be reinitiated at the beginning of a cycle (the Air Defense Program is a series of subprograms which operate in turn on the latest input data), with the new data available to it at the moment.

During a trial period, FIX was found to provide automatic recovery from more than 92% of the failures. Of the remaining errors, 6% were due to operator and program errors. The remaining 2% required unscheduled maintenance.

Systems Design

SAVING KEYSTROKES

Les Matthies, Ross-Martin Co.
LA SPAN, January 1959 (Newsletter of Los Angeles SPA Chapter)

Typing efficiency

The use of the typewriter to write forms is so prevalent in most companies that it behooves the systems man to examine these procedures for possible time-saving changes. For example, a single keystroke costs .0002 cents, and other typing operations, such as shifting or tabulating, range up to .0025 cents, or 12-1/2 times as much as one keystroke. By redesigning the form to eliminate unnecessary information, or by abbreviating wherever possible, keystrokes may be cut by 20%, with a resulting time saving of 20%.

((Another possibility for saving time and money in the typing operation, especially as it relates to the problems of fast, accurate input in EDP systems, is the redesign of the keyboard. There is nothing scientific about the present keyboard design. It was a random and arbitrary positioning of letters by the early inventors of the typing machine. An excellent documentation of typewriter history is "The Wonderful Writing Machine," a book written by Bruce Bliven, published in 1954 by Random House. The August 1956 issue of Systems and Procedures Quarterly included a description of the Dvorak Simplified Keyboard which was successfully tested by the U. S. Navy in 1944. However, inertia and resistance to change have kept this excellent keyboard design from being accepted by business, government, business schools and equipment manufacturers.))

APPLYING THE SYSTEMS APPROACH TO WAREHOUSING

R. J. Marland, General Electric Co.
CONTROL ENGINEERING, January 1959; pages 65-70.

Five degrees of automation in warehousing are discussed: manual, dispatch system, sensing system, automatic loading and unloading, and automatic data logging. It is shown that efficient warehousing not only is dependent upon but even influences methods of producing the items to be kept in finished or partially finished inventory.

Machine Linguistics

CURRENT RESEARCH AND DEVELOPMENT IN SCIENTIFIC DOCUMENTATION

Published by National Science Foundation

This is the third in a continuing series of updated reports on developments in scientific documentation, edited by the National Science Foundation. The pamphlet is a collection of short reports by organizations and individuals who are doing experimental work in this field. The reports cover these subjects: information requirements and uses; research on information storage and retrieval; mechanical translation; equipment development; and miscellaneous information. Where reports might be classified in more than one section, they are cross referenced.

Scientists and others concerned with scientific documentation are asked to submit information on pertinent programs for these reports. The report number is NSF-58-33. It may be purchased from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price, 30 cents.

DATASEARCH

DataSearch, Inc. offers electronic design engineers an information retrieval service which collects, processes and indexes data on electronic components. The first two components offered are transistors and resistors. These will be followed by diodes, capacitors, transformers, and other electronic parts. PIK-N-PEEK tab-size cards are used, one for each type of characteristic. These are punched to show which of the 500 components listed on the card have that particular characteristic.

Manual use for tab cards

When a card for each desired characteristic is pulled from the file and the cards are lined up, those components having the desired group of characteristics show up as holes through the entire group of cards. Being a manual method, it is easily handled in a design office. When information retrieval equipment is available later on, the cards may be processed automatically to give the desired information.

DataSearch provides the cards, a list of searching characteristics, and a table of component characteristics, including names of manufacturers. The information is updated each month. Cost is $60 for the first year for transistors, $50 for resistors, less in subsequent years. For information, write: DataSearch, Inc., 15510 Norwood Pike, RFD #1, Silver Spring, Maryland.

Applications

AMERICAN AIRLINES AUTOMATES RESERVATIONS FOR THE JET AGE

MANAGEMENT AND BUSINESS AUTOMATION, January 1959; pages 15-18, 31-33

The American Airlines Reservisor is described ((see DPD: October 1957, page 10)). A master set controls the information in the drum and may be used to alter it when necessary; for example, when there are deviations from the standard schedule such as cancelled flights. Each midnight, the information for the day just past is removed from the drum and new information for the new "30th day" is added. Reservations made for more than 30 days ahead are kept on a chart, and are added to inventory as they become 30th day information.

Small computer directs messages to the right stations

When a flight is sold out, the monitor printer prints the date and flight number and simultaneously a paper tape is punched with the information. A Royal McBee computer is used to accept the tape message, determine what stations need the "sold out" information, and produce the message and routing in five channel tape for transmission on American's automatic Teletype system. The information is available to the entire system within seconds after the Reservisor issues its "sold out" signal.

Another piece of equipment called DOT, or Data Organizing Translator, accepts keypunched reservation records and processes the information into messages for each station affected by the reservations, codes, and prepares the Teletype tape for transmission. Copies of each message are produced automatically on an electric typewriter. In this manner, a passenger's reservation which covers several legs, and possibly more than one airline, is processed at each of its stopover or transfer points before he begins his trip.

Passenger information is transmitted by teletype and automatically typed on separate cards which may be detached and placed in the system for machine processing. "Teleticketing" is a system designed for volume users of air transportation. A special Teletype receiver accepts a continuous seven-part ticket form which is prepared from previously prepared tape in the airlines office.

ORDER SERVICE, SHIPPING & BILLING ON A 305 RAMAC

Donald L. Marvel, General Electric Co., Fort Wayne, Indiana
JOURNAL OF MACHINE ACCOUNTING, January 1959; pages 10-13, 16

The method by which the company's RAMAC processes orders and performs attendant operations is described in some detail. When an order is received, codes are added to the document which repre-

sent repetitive information; then requisition cards are key punched which contain all the essential data. After verification, the cards are used as input to the RAMAC file.

Product release cards initiate shipping-billing orders

As each requisition is entered, the RAMAC determines whether it is a stock product, and whether stock is available. If available, a stock release card is punched for re-entry later on. If stock is not available, the item is automatically back-ordered, and a card is punched to notify the customer that his order was received. Stock balance is figured, and if the order point has been reached, a stock replinishment card is prepared.

For a non-stock item, a requisition is printed and release cards are punched, and all are sent to the manufacturing section. As items are built and packed for shipment, the weight and quantity are marked on the release cards and returned to the RAMAC. These are used for the Shipping-Billing operation. A combined shipping-billing form is placed on the printer. The computer consults the original requisition card for the statistical data needed to print the bill heading. The bill is then figured and printed on the form. When all the items have been extended, the computer determines the cheapest method of transportation and the charges, then calculates taxes, if applicable. During this time, new release cards containing the current status of the requisition are punched for distribution to the manufacturing section for more shipments. Simultaneously, information for management reports is assembled. These include: open order status in terms of products, dollar value, and shipments made during the last period; complete sales and cost analysis reports; production statistics.

MAKING THE SHIFT TO ELECTRONIC BOOKKEEPING

Raymond C. Deering, Manufacturers Trust Co., New York
BURROUGHS CLEARING HOUSE, January 1959; pages 44, 45, 86, 87

Manufacturers Trust Company uses 21 electronic bookkeeping machines to replace 48 mechanical machines. They found they needed between 90 and 120 days for efficient changeover after notifying the customers and distributing account-numbered checkbooks.

Account numbers assigned from 7-year supply

A nine-digit account number was chosen. The first three digits designate branch or department, the next five identify the customer, and the final digit is a check digit. Customers' accounts apparently were numbered randomly or approximately in order as filed. New customers receive consecutive numbers from a seven-year supply printed on blank cards. Address plates carry the number, and from these two sets of file cards were made: one set for branch address files, the other as an order for preparation of imprinted checks. Those who had a large supply of custom checks on hand received a hand stamp to imprint their checks until the

supply was depleted. Each customer received an identification card containing his name and account number. The bank discovered that within 30 days about 95% of all commercial account deposit tickets were carrying the account numbers. Education of the customers through letters and personal contact with the tellers helped put the plan across in record time.

THEY BUY COMPUTER TIME TO CONTROL PRODUCTION

BUSINESS, January 1959; pages 56-59

Job White and Sons Ltd., an English textile firm with about 600 workers, controls most of its manufacturing operations by a computer system which is more than 30 miles away, and which is hired for one to two hours a week at a cost of about 50 pounds.

Computer figures knitting machine instructions

Each Wednesday, the machine plans production for the coming week by assembling customers' orders into economic batches. It prepares detailed instructions for the machine operators, which consist of winding instructions for each knitting machine. The instructions are designed to minimize the number of bobbin changes during the run. If done manually, the calculations for the 1000 weekly sets of winding instructions would take between 15 and 30 minutes each. The instructions are based on analysis of orders, stock on hand, dyeing requirements and other variables.

Although this is an unusual use for a computer in a production control application, apparently the remainder of the plant's operations, such as garment production control and order filling, are done entirely by clerical data processing. The article indicates that thought is being given to extending the system to the preparation of invoices.

Equipment

IBM AUTOMATED BANKING EQUIPMENT

The IBM banking equipment consists of four units: a proof-inscriber, a sorter-reader, a utility inscriber and a control unit. Checks are preprinted before issue with magnetic ink symbols for routing, transit, and account numbers. These symbols meet the ABA specifications. At the proof-inscriber the dollar amount and control information is written in magnetic ink. At the same time the

proof-inscriber lists and totals the transactions, accumulates totals for proving balances, prints endorsements, and establishes control totals.

Next, the sorter-reader sorts the checks and reads magnetic ink data from the checks for entering into the IBM system (which may be a 407 accounting machine, a 650, 705 or 7070 computer system). A utility inscriber can inscribe any necessary substitute documents with magnetic ink symbols for processing.

PAPER TAPE INPUT FOR THE IBM 650

DATA PROCESSING, December 1958

Direct paper tape input to the IBM 650 system is through the use of the IBM 46 and 47 Model 3 Tape to Card Punch. Information may be read into the IBM 650 from either five- or eight-channel tape at speeds of up to 20 characters a second. The 650 controls the reading, and may continue processing of information while the tape is being read. The tape can contain machine function codes as well as data, and the information can be recoded, eliminated or expanded through control panel wiring.

FILMOREX

The Filmorex System is a method of filing scientific literature on microfilm with an abstract of the article printed in a code alongside the printed page. The micro-cards are 2-3/8 by 1-3/8 pieces of film. About half the film is used for the literature page. The other half contains the coded abstract. A Filmorex Selector searches for the desired literature by scanning the coded portion of each card. The selected cards may be viewed in a film reader or printed enlargements may be made. The system is made in France. For information, write: Eugene Garfield Associates, 1523 Spring Garden Street, Philadelphia 30, Pa.

STANTEC ZEBRA

The ZEBRA computer, built by Standard Telephones and Cables Ltd., of England, is a drum machine designed mainly for engineering and scientific purposes. It has no magnetic tapes. It has unusual logic for programing, in that it may be used as a 1 + 1 address (similar to the IBM 650), a 2-address (similar to the RCA 501), or a 1 + B modifying address machine (similar to the Datatron 205), with any of 12 immediate access registers being used for order modification. Cost of the basic system is $120,000. U.S. representative is Intelex Systems, 22 Thames Street, New York 6, N. Y.

TV AS A BUSINESS MACHINE

MANAGEMENT AND BUSINESS AUTOMATION, January 1959; page 37

A closed circuit television camera has been combined with code reading and printing equipment to produce a system for reading numbers in five-channel code and automatically printing them out on a teletypewriter. At the same time, the coded or arabic numbers may be viewed on a remote TV screen. The system will also produce a five-channel tape. One suggested application is in the automatic transmission and recording of railroad car numbers. An advantage of the system is that a person watching the TV monitor can note conditions of the cars and verify other information as they pass before him on the screen. The system has been devised by the TelAutovision division of TelAutograph Corp., Los Angeles.

HONEYWELL 800

A new medium-scale, transistorized data processing system called the Honeywell 800 has been designed by DATAmatic, division of Minneapolis-Honeywell. The computer is designed for both business and scientific use, in decimal or binary arithmetic. A feature called Automatic Parallel Processing allows the computer to perform as many as eight programs in parallel. The Parallel Processing is a combination of Traffic Control--a device which monitors all peripheral activities of the system and provides the proper channel connections at the proper time--and Multi-program Control--which coordinates the demands of up to eight completely independent programs running in parallel.

The Honeywell 800 incorporates the DATAmatic self-correcting feature, Orthotronic Control. Internal operating speed is 30,000 three-address operations per second. Magnetic core storage is in modules of 4096 words. One to four modules may be used in the system. Data is recorded on 3/4 inch Mylar-base tape.

COMPUTERS AND AUTOMATION IN THE U.S.S.R.

Eugene M. Grabbe, Thompson Ramo Wooldridge Inc., Los Angeles
Paper presented to the Los Angeles Chapter of A.C.M.

At present there are about 400 electronic digital computers in operation in the U.S.S.R. The URAL is the only computer known to be in production. This computer is comparable to the IBM 650, and sells for about $200,000.00 at the official exchange rate of four rubles per dollar. The STRELA is similar to an IBM 701, and sold for about $1 million. A new machine, unnamed as yet, will be four times as fast as the 704. It will use magnetic core storage with six microsecond access time.

Comment

A basic list for EDP study

A THIRD READING LIST

For the third year, DPD's editors have selected a group of books and articles for a beginning study in electronic data processing. Not all the material is elementary, but rather, the selections represent our opinion of the best literature that we know of in each classification. Some of the references have been retained for three years, and will be kept until better material replaces them. All of the references have been reviewed or abstracted in Data Processing Digest. The hyphenated numbers at the end of each reference give the volume, month, and page, in that order, of the issue in which the review or abstract will be found. Included in the References on page 17 are the addresses of the publishers to help you obtain those items of interest to you.

This material has been selected for persons who wish to begin the study of EDP or who wish to review what they have learned in the past. There are undoubtedly many excellent selections which do not appear on this list. However, we believe that this group will provide a basic understanding of the electronic data processing field for those who wish to pursue a personal program of study.

GENERAL INFORMATION

Electronic Data Processing for Business and Industry
Richard G. Canning; John Wiley & Sons, 1955. (2-4-7)

The Auditor Encounters Electronic Data Processing
Report prepared by Price Waterhouse & Co. (3-4-1)

Business Electronics Reference Guide (Volumes 3 and 4)*
Controllership Foundation, 1956, 1958. (3-4-10, 4-9-4)

Administering a Conversion to Electronic Accounting
Harold Farlow Craig; Harvard Business School, 1955. (3-4-6)

Office Equipment: Buy or Rent?
Robert N. Anthony and Samuel Schwartz; Management Analysis Center, Inc. (3-8-7)

Installing Electronic Data Processing Systems
Richard G. Canning; John Wiley & Sons, 1957. (4-2-3)

Case Studies in Industrial Management
J. M. Juran and Norman N. Barish; McGraw-Hill, 1955. (4-2-5)

Facilities for a Large Computer Installation
Robert B. Curry; Advanced Management, January 1958, pg. 5. (4-3-1)

Automation in Check Handling
Burroughs Clearing House, February 1958, pg. 35. (4-4-1)

The Automatic Creation of Literature Abstracts
H. P. Luhn; IBM Journal of Research and Development, April 1958, pg. 159. (4-6-1)

* The 1958 edition is not an updated version of volume 3, but rather is supplementary, especially in listings of literature.

High-speed Data Processing
C. C. Gotlieb and J. N. P. Hume; McGraw-Hill, 1958. (4-6-5)
Special Report: Computers
Business Week, June 21, 1958, pg. 68. (4-8-7)
Industrial Dynamics--A Major Breakthrough for Decision Makers
Jay W. Forrester; Harvard Business Review, July-August, 1958, pg. 37. (4-9-1)
An Automation Timetable
Alvin J. Vogel; Banking, September 1958, pg. 70. (4-10-5)
Cutting the Cost of Your EDP Installation
Canning, Sisson and Associates, 1958. (4-10-6)

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C. West Churchman, Russel L. Ackoff, and E. Leonard Arnoff; John Wiley & Sons, 1957. (3-3-8)
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American Management Association, 1957. (4-2-6)
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Brian Dagnall; Automation Progress, May 1958, pg. 194. (4-7-1)
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Factory Management and Maintenance, July 1957, pg. 84. (3-8-9)
Office Automation Applications (Updating Service)
R. Hunt Brown; Automation Consultants, Inc. (4-2-11)
Electronic Brain Manages Sperry Inventory
Charles G. Schaefer; Aeronautical Purchasing, September 1958, pg. 19. (4-11-14)

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Program Control Techniques
Mrs. Frances Holbertson; The Programmer, September 1956, pg. 4. (3-2-9)
The Importance of Program Maintenance
John Boccomino; Systems and Procedures, August 1957, pg. 9 (3-11-1)
Tape File Maintenance
John H. Hughes; The Programmer, July 1957. (3-12-10)
Digital Computer Programming
D. McCracken; John Wiley & Sons, 1957. (3-7-13)
Automatic Coding Symposium--Franklin Institute
Computing News, August 15, 1957 (3-10-13)
Sorting
Data Processing Digest (Comment). (4-4-14)

Automatic Preparation of Flow Chart Listings
A. E. Scott; Journal of the A. C. M., January 1958, pg. 57. (4-5-1)
Guideposts for System Design
Sherman C. Blumenthal; Univac Review, Spring 1958, pg. 8. (4-10-1)

EQUIPMENT

Office Automation (Updating Service)
R. Hunt Brown, Automation Consultants, Inc. (1-11-7)

References

The publishers of books and periodicals mentioned in this issue of DATA PROCESSING DIGEST are listed below for your convenience in writing for more complete information.

Advanced Management
74 Fifth Avenue
New York 11, New York

Aeronautical Procurement
(formerly Aero. Purchasing)
812 Huron Road
Cleveland 15, Ohio

American Management Association
1515 Broadway, Times Square
New York 36, New York

Automation Consultants, Inc.
155 Fifth Avenue
New York 18, New York

Automation Progress
Stratford House
9 Eden Street
London NW 1, England

Banking
12 East 36th Street
New York 16, New York

Burroughs Clearing House
2nd and Burroughs Ave.
Detroit 32, Michigan

Business
Mercury House
109-119 Waterloo Rd.
London SE 1, England

Business Week
330 West 42nd Street
New York 36, New York

Canning, Sisson and Associates
1140 South Robertson Blvd.
Los Angeles 35, California

Computers and Automation
815 Washington Street
Newtonville 60, Mass.

Computing News
12805 - 64th Ave. South
Seattle 88, Washington

Control Engineering
330 West 42nd St.
New York 36, New York

Controllership Foundation, Inc.
Two Park Avenue
New York 16, New York

Data Processor
IBM Corporation
590 Madison Avenue
New York 22, New York

Factory Management & Maintenance
330 West 42nd St.
New York 36, New York

Harvard Business Review
Soldiers Field Station
Boston 63, Mass.

Harvard Business School
(Same as: Harvard Business Review)

IBM Journal of Research and
Development
590 Madison Avenue
New York 22, New York

Journal of A. C. M.
2 E. 63rd St.
New York 21, New York

Journal of Machine Accounting
208 South Main St.
Paris, Illinois

Management Analysis Center, Inc.
275 Newbury Street
Boston 16, Mass.

Management and Business Automation
600 West Jackson Blvd.
Chicago 6, Illinois

McGraw-Hill Book Co., Inc.
330 West 42nd St.
New York 36, New York

N. A. A. Bulletin
505 Park Avenue
New York 22, New York

Office Management
212 Fifth Avenue
New York 10, New York

Price Waterhouse & Co.
56 Pine Street
New York 5, New York

The Programmer
Remington Rand Univac
315 Fourth Avenue
New York 10, New York

Systems and Procedures Association
4463 Penobscot Building
Detroit 26, Michigan

Systems and Procedures Magazine
(Same as: Systems and Procedures
Association)

Univac Review
(Same as: The Programmer)

John Wiley & Sons, Inc.
440 Fourth Avenue
New York 16, New York

Meetings

Life Office Management Association Automation Forum
Date: April 13-15, 1959
Place: Chicago, Ill.
Information: Life Office Management Association,
110 E. 42nd St., New York 17, New York

ORSA National Meeting
Date: May 14, 15, 1959
Place: Washington, D. C. (Shoreham Hotel)
Information: Operations Research Society of America,
Mt. Royal & Guilford Ave., Baltimore 2, Md.

"Expanding Horizons of Industrial Engineering," National Conference, American Institute of Industrial Engineers
Date: May 14-16, 1959
Place: Atlanta, Georgia (Biltmore Hotel)
Fee: Members, $39.50; non-members, $49.50. (Single event fees also available)
Information: AIIE, 145 North High St., Columbus 15, Ohio

NOMA Conference and Exposition
Date: May 24-27, 1959
Place: New Orleans, Louisiana (Roosevelt Hotel)
Information: W. H. Latham, NOMA, Willow Grove, Pennsylvania

International Conference on Information Processing
Date: June 15-20, 1959
Place: Paris, France
Information: U. S. Committee for the First International Conference on Information Processing, Box 4999, Washington 8, D. C.

International Accounting Conference
Date: June 21-24, 1959
Place: New York (Waldorf-Astoria)
Information: Robert F. Nolan, National Association of Accountants,
505 Park Ave., New York 22, N. Y.

British Computer Society First Annual Conference
Date: June 22-25, 1959
Place: Cambridge, England
Information: British Computer Society, Finsbury Court,
Finsbury Pavement, London EC 2, England

NMAA National Conference
Date: June 24-26, 1959
Place: St. Louis, Missouri (Chase-Park Plaza Hotels)
Information: National Machine Accountants Association,
208 South Main Street, Paris, Illinois

Sixth Annual Symposium on Computers and Data Processing, sponsored by Denver Research Institute

Date: July 30, 31, 1959
Place: Estes Park, Colorado (Stanley Hotel)
Program: Four half-day sessions devoted to each of following: Components, Logical Design, Computer Design, Systems Organization
Information: W. H. Eichelberger, Denver Research Institute, University of Denver, Denver 10, Colorado

1959 ACM National Conference

Date: Summer, 1959
Place: M.I.T.
Information: F. Verzuh, Massachusetts Institute of Technology, Cambridge, Mass.

TIMS International Meeting

Date: September, 1959
Place: Paris, France
Information: The Institute of Management Science, Attn: Harold Cauvet, 250 North Street, White Plains, New York

ISA Conference

Date: September 21-25, 1959
Place: Chicago, Illinois
Information: Instrument Society of America, 313 Sixth Avenue Pittsburgh 22, Pennsylvania

International Automation Exposition-Congress

Date: November 16-20, 1959
Place: New York (Trade Show Bldg.)
Information: Richard Rimbach, 845 Ridge Ave., Pittsburgh 12, Pa.

Training

"Electronic Data Processing for Business and Industry" (Course 10), presented by Richard G. Canning

Date: March 9-13, 1959
Place: New York (Hotel Roosevelt)
Fee: $250
Program: Emphasis on the applications aspect of electronic data processing. Four guest lecturers on specific applications.
For whom: Management personnel charged with setting up an EDP system
Information: Richard G. Canning, 1140 South Robertson Blvd., Los Angeles 35, California

"Management Concepts in Operations Research," presented by Harvey N. Shycon Company

Date: April 6-8, 1959
Place: Boston, Mass. (Harvard Club)
Fee: $200
Content: Includes practical examples of applications of OR techniques in actual business situations.
Information: Harvey N. Shycon Company, Park Square Building, Boston, Mass.

"Successfully Installing an Electronic Data Processing System" (Course 20), presented by Richard G. Canning

Date: April 20-24, 1959
Place: New York (Hotel Biltmore)
Fee: $250
Program: Organization, personnel, physical installation, conversion, operation of the EDP system are the subjects covered. It is desirable, but not required, that attendees have taken Course 10 or its equivalent.
Information: Richard G. Canning, 1140 South Robertson Blvd., Los Angeles 35, California

Automation in California, A Conducted Tour of Practical Applications

Date: June 15-27, 1959
Place: Tour leaving San Diego, and visiting EDP installations and computer manufacturers in Los Angeles, Pasadena, San Francisco, Palo Alto, and other points
Fee: $125 (including rooms, but excluding meals)
Registration deadline: April 15, 1959
Information: Dr. E. Dana Gibson, San Diego State College, San Diego, California.

COLLEGE COURSES

Stanford University, Graduate School of Business, Spring Quarter: "Introduction to Electronic Data Processing," leading to M.B.A. degree. For information, write to Admissions Office, Graduate School of Business, Stanford University, Stanford, California.

Orange Coast College, Second Semester: "Business Data Processing," including history and development of EDP, Machine Accounting and Punched Card Operations, Introduction to Computers. For information, write to John J. Dufour, Business Education, Orange Coast College, Costa Mesa, California.

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